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(54) VENTILATOR VALVE

(71) I, MAX GÜNTER SCHADE, a German citizen of Parkstrasse 36, 5060 Bensberg, West Germany do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:–

This invention relates to ventilator valves of the kind comprising a substantially circular base plate in which is formed a substantially semicircular aperture occupying substantially one half of the area of the base plate, and a rotatably mounted closure shutter adapted in one rotational position to permit the passage of air through the aperture and in another position to overlie the aperture to close the valve. A ventilator valve of this kind is disclosed in German Patent Specification No. 2,322,913.

It is an object of the invention to provide an improved ventilator valve of this kind, and according to the invention there is provided a ventilator valve comprising a substantially circular base plate formed with a substantially semicircular aperture occupying substantially one half of the area of the base plate, said base plate being bounded by an annular raised flange portion and an outer axially extending rim portion, a substantially circular closure disc being mounted for rotation coaxially with respect to said base plate and in engagement with said flange portion said disc being formed with a substantially semicircular aperture substantially registering with said base plate aperture in the fully open condition of the valve and being rotatable to a position in which the remainder of the disc overlies said base plate aperture in the closed condition of the valve, and a temperature responsive locking member mounted on said disc and adapted to engage in a selected one of a plurality of radially inwardly open recesses formed in said rim portion to hold the valve open, the arrangement being such that at a predetermined temperature said locking member releases its engagement with the said recess and the disc rotates to close the valve.

An advantage of the ventilator valve in accordance with the invention is that the disc may be maintained in close engagement with the flange in all of its operational positions, counteracting the effect of gravity experienced in the hitherto known semicircular shutters which had a gravitational component directed parallel to the axis of rotation of the shutter.

In one embodiment of the invention said disc is biased into the closed position under gravitational action when disposed in a vertical plane.

In order however to ensure proper closure of the valve in any orientation the disc is preferably spring biassed into its closed position. An advantage of this embodiment lies in the fact that the embodiment with closure spring can also be used in an installation position in which the disc does not rotate in a vertical plane, i.e. the rotational axis is not aligned horizontally. This embodiment even remains fully functionable if the disc rotates in a horizontal plane.

Preferably an end of the spring cooperating with said disc engages a stop element integral with the disc, and furthermore the spring may be disposed around and anchored to a shaft for the disc. The spring, which may be helicoidal or spiral, may be mounted on the side of the disc remote from the base plate and may serve also to bias the disc into engagement with the flange.

In a preferred embodiment the disc is provided with a lug and the rim with an abutment, the lug abutting the abutment in the closed position of the disc. In this case it is advantageous if over the angle of pivotal movement of said lug the rim is radially outwardly offset in relation to the recess-

containing portion or provided with a peripheral aperture the abutment being formed at one end of the offset portion or aperture and the lug on the disc lying opposite the abutment in the fully open condition.

There may be provided a housing for the base plate/disc assembly the disc being mounted on a shaft secured to the housing in such a way as to urge the disc axially under elastic tension into engagement with the flange. Here, the shaft may be secured to a base of the housing between two parallel incisions in the base providing a spring strap. Preferably the base of the housing is axially space from said base plate and is formed with a substantially semicircular aperture offset by substantially 180° with respect to the aperture in the base plate, and to the end of the shaft adjacent the disc may be secured a perforated flow grille contacting a rim of the housing.

The housing may be provided with an annular shoulder in face to face engagement with said flange, the shoulder and flange being each formed with at least one mutually engaging locating depression or projection.

In order that the invention may be readily understood an embodiment thereof will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 shows in plan view an embodiment of ventilator valve not in accordance with the invention but illustrating preferred features thereof,

Figure 2 shows in detail the spiral spring of Figure 1,

Figure 3 shows in plan view a ventilator valve in accordance with the invention,

Figure 4 is a sectional view along the line IV–IV of Figure 3,

Figure 5 shows in plan the housing of the Figure 3 embodiment,

Figure 6 shows in plan the closure disc of the Figure 3 embodiment, and

Figure 7 shows in plan view a second embodiment of ventilator valve not in accordance with the invention but illustrating preferred features thereof.

The ventilator valve shown in Figure 1 comprises a cylindrical housing 1 with a substantially semicircular aperture 6 formed in a base plate 4. A substantially circular flange 25 is formed in base plate 4 surrounding aperture 6. On a shaft 5 there is rotatably mounted a substantially semicircular disc 2 which is arranged parallel to the base plate 4 in the installation position of the ventilator valve in front of the same and engages at its outer edge the flange 25. At the transition from the curved edge into the straight edge of the disc a lug 22 is provided on one side, whereas on the opposite side a locking member 7 in the form of a bursting cartridge is inserted exchangeably on the opposite side on a stirrup 10 integral with the disc. Extending forwardly from the base plate 4, concentrically to the aperture 6, there is arranged a rim 3 with its principal faces aligned axially which rim is formed in the region adjacent the aperture 6, arranged at intervals, radially inwardly directed recesses 9 in which the tip 8 of the locking member 7 engages. The flow cross-section of the aperture 6 can be adjusted as a function of the position of engagement between the tip 8 of the locking member 7 and the corresponding recess 9. In the embodiment shown in Figure 1, the largest cross-section of the aperture 6 has been selected. The rim 3 has on the curved section confronting the recesses 9 a peripheral aperture or a radially outwardly offset flange wall 21, within which, when the disc 2 is rotated, the lug 22 can move as far as a stop 23 provided on the rim 3, whilst when the lug 22 and the rim 23 are in mutual contact the closed position has been reached in which the disc 2 masks the total cross-section of aperture 6.

As may be seen from Figure 2, round the shaft 5 there is arranged, in front of the disc 2 in the installation position of the ventilator valve, a spiral spring 31, one end 32 of which is secured to the fixed journal, whereas the other end 33 is in engagement with the disc 2. The other end 33 is constructed as a bracing structure which has the form of a triangle in the exemplary embodiment illustrated. This triangle, on the one hand, braces a part of the disc 2 in the axial direction, which is thereby pressed against the flange 25 round base plate 4 and aperture 6. The end 33 of the spiral spring 31, which is bent in triangular shape for the purpose of bracing, is in contact with pretension against the stirrup 10 carrying the locking member 7. The pre-tension of the spiral spring 31 is dimensioned so that after dis-engagement of the locking member 7 and the corresponding recess 9, the disc 2 is rotated into the closed position, in which the lug 22 is in contact with the stop 23. The pretension is sufficient to maintain the disc 2 in the closed position. Simultaneously, due to the bracing function of the spring end 33, the outer edge of disc 2 is pressed tightly against the flange 25, whereas at its straight edge rests tightly upon a radial web 24 of the base plate 4.

The embodiment illustrated in Figures 3–6 differs from the previous embodiment substantially in that the disc 2 is substantially circular and has formed therein a substantially semicircular aperture 20. The disc 2 with its annular edge 26 thus rests through its entire circular circumference upon the base plate 4 and its flange 25, so that when the disc 2 is rotated out of the open position

into the closed position, no tilting moments about the shaft 5 can influence the disc 2.

Also in the embodiment shown in Figures 3–6, instead of the spiral spring 31 of the embodiment of Figures 1 and 2, a helicoidal spring 41 is arranged round the shaft 5. This helicoidal spring 41 is retained by its one end 42 in a disc 43 which is fixedly attached to shaft 5. The other end of the helicoidal spring 41 extends in the form of a spring stirrup 47 approximately radially, while the end 48 of the spring stirrup 47 engages the stirrup 10 carried by the locking member 7. The helicoidal spring 41 is pre-tensioned so that when the engagement of the locking member 7 in a recess 9 is cancelled the disc 2 is urged into the closed position in which the lug 22 engages the stop 23.

Alternatively, there may also be fastened on the disc 2 a stop pin 49 which is engaged by the spring stirrup 47, which is then of shortened construction. The stop pin 49 is shown by chain dotted lines in Figure 3.

As may be seen from Figure 4, the housing 1 is formed with a radial shoulder 11 with which the flange 25 of the base plate 4 is in contact.

The housing 1 is constructed with a housing base 13 which is arranged axially at a predetermined distance from the base plate 4 and is formed with a substantially semicircular aperture 12 which is arranged offset by 180° with respect to the aperture 6 in the base plate 4. By this means a reduction of noise is obtained due to the deflection of the airstream.

Starting from the rim of the aperture 12, two parallel slits 16 are cut into the housing base 13 symmetrically about the longitudinal axis of the housing, so that a spring strap 15 with a bore for the journal 5 is formed. The journal 5 is fixed to the spring strap 15 by means of a threaded nut 14 and which maintains it pre-tensioned in the axial direction. Also arranged on the journal 5 is a sleeve 50 which is pressed against the disc 2 by means of the journal pre-tensioned axially by the spring strap 15 and presses the disc 2 against the web 24 and flange 25.

The other end of the journal 5, which is surrounded by the helicoidal spring 41, is formed with a bore with a female screwthread into which a screw 45 engages which maintains a flow grille 44 provided with perforations against the end face edge of the housing 1. By screwing the screw 45 in the journal 5, the flow grille 44 is simultaneously drawn slightly inwards. As a result of this elastic pre-tensioning, the disc 2 is pressed by a nut 14 mounted on the journal 5 against the axial web 24 and the flange 25 of the base plate 4. Consequently even if, in the case of fire, the pre-tension of the helicoidal spring 41 should be lost by annealing, the disc 2 is still maintained in tight contact with the web 24 and flange 25. As may be seen from Figure 6, the aperture 20 in the disc 2 is segment-shaped, i.e. slightly smaller than a semi-circle, and is surrounded by the annular edge 26 and the radial edge of the disc 2.

Whereas the embodiments illustrated in Figures 1 to 6 are suitable for installation both in ceilings and in vertical walls, the embodiment illustrated in Figure 7 serves solely for installation in vertical walls. The embodiment illustrated in Figure 7 differs from the embodiment of Figures 3–6 in that the closure spring is absent and the disc 2 is semicircular. The disc 2 is arranged in the open position illustrated in such a way that when in the event of an excessive temperature of the medium flowing through the aperture 6, the cartridge 7 bursts, the bracing of the disc 2 is cancelled and then, since its centre of gravity lies outside and to the side of its rotational axis, it is rotated by the moment caused by the force of gravity into the closed position, which corresponds to the equilibrium position of the disc 2 or is slightly displaced with respect to the latter so that the lug 22 of the disc 2 abuts with the stop 23. Thus, when or before the disc 2 reaches its equilibrium position, the lug 22 at its end opposite the cartridge 7 comes into engagement with the stop 23, so that the disc 2 is not rotated beyond the equilibrium position by its moment of inertia. The disc 2 is thus maintained positively in the closed position, in which it totally closes the passage aperture 6, under the force of gravity.

As illustrated in the upper part of Figure 4, the annular edge 11 of the housing 1 and also the rim flange 25 of the base plate 4 are deformed in a position 17 and 18 respectively so that a locating depression and projection are formed. These engage in one another in the installation position of the housing 1 and in the service position of the base plate 4 in the housing 1.

WHAT I CLAIM IS:–

1. A ventilator valve comprising a substantially circular base plate formed with a substantially semicircular aperture occupying substantially one half of the area of the base plate, said base plate being bounded by an annular raised flange portion and an outer axially extending rim portion, a substantially circular closure disc being mounted for rotation coaxially with respect to said base plate and in engagement with said flange portion said disc being formed with a substantially semicircular aperture substantially registering with said base plate aperture in the fully open condition of the valve and being rotatable to a position in which the remainder of the disc overlies said base plate aperture in the closed condition of the valve, and a temperature responsive locking member mounted on said disc and

adapted to engage in a selected one of a plurality of radially inwardly open recesses formed in said rim portion to hold the valve open, the arrangement being such that at a predetermined temperature said locking member releases its engagement with the said recess and the disc rotates to close the valve.

2. A ventilator valve according to claim 1 in which said disc is biassed into its closed position under gravitational action when disposed in a vertical plane.

3. A ventilator valve according to claim 1 in which said disc is spring biassed into its closed position.

4. A ventilator valve according to claim 3 in which an end of the spring cooperating with said disc engages a stop element integral with the disc.

5. A ventilator valve according to claims 3 or 4 in which the spring is disposed around and anchored to a shaft for the disc.

6. A ventilator valve according to any of claims 3 to 6 in which the spring is mounted on the side of the disc remote from the base plate.

7. A ventilator valve according to any of claims 3 to 7 in which the spring serve also to bias the disc into engagement with the flange.

8. A ventilator valve according to any of claims 3 to 8 in which the spring is helicoidal.

9. A ventilator valve according to any of claims 3 to 8 in which the spring is spiral.

10. A ventilator valve according to any of the preceding claims in which the disc is provided with a lug and the rim with an abutment, the lug abutting the abutment in the closed position of the disc.

11. A ventilator valve according to claim 10 in which over the angle of pivotal movement of said lug the rim is radially outwardly offset in relation to the recess-containing portion or provided with a peripheral aperture the abutment being formed at one end of the offset portion or aperture and the lug on the disc lying opposite the abutment in the fully open condition.

12. A ventilator valve according to any of the preceding claims including a housing for the base plate/disc assembly the disc being mounted on a shaft secured to the housing in such a way as to urge the disc axially under elastic tension into engagement with the flange.

13. A ventilator valve according to claim 12 in which the shaft is secured to a base of the housing between two parallel incisions in the base providing a spring strap.

14. A ventilator valve according to claim 12 or 13 in which the base of the housing is axially spaced from said base plate and is formed with a substantially semicircular aperture offset by substantially 180° with respect to the aperture in the base plate.

15. A ventilator valve according to claims 12, 13 or 14 in which to the end of the shaft adjacent the disc is secured a perforated flow grille contacting a rim of the housing

16. A ventilator valve according to any of claims 12 to 15 in which the housing is provided with an annular shoulder in face to face engagement with said flange, the shoulder and flange being each formed with at least one mutually engaging locating depression or projection.

17. A ventilator valve according to claims 2 and 10 or 2 and 11 in which the lug abuts the abutment before the disc reaches equilibrium such that the lug and abutment are urged into contact by the weight of the disc.

18. A ventilator valve according to claim 1 and substantially as hereinbefore described with reference to the accompanying drawings.

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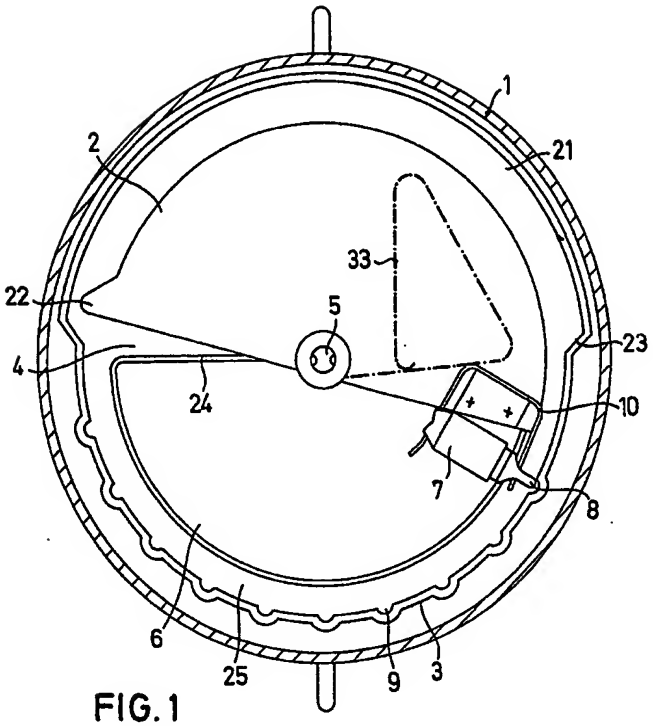

FIG. 1

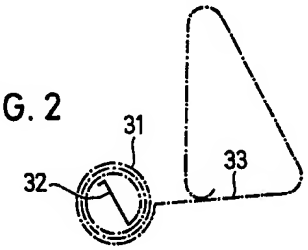

FIG. 2

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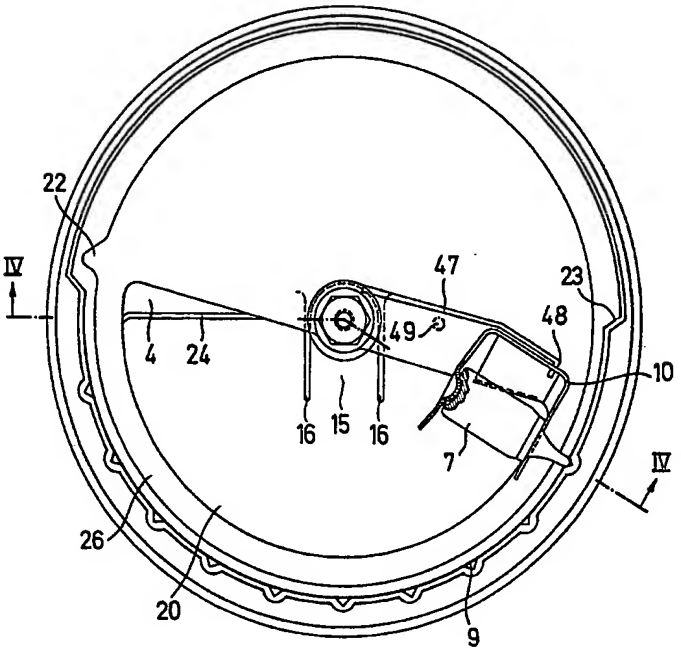

FIG. 3

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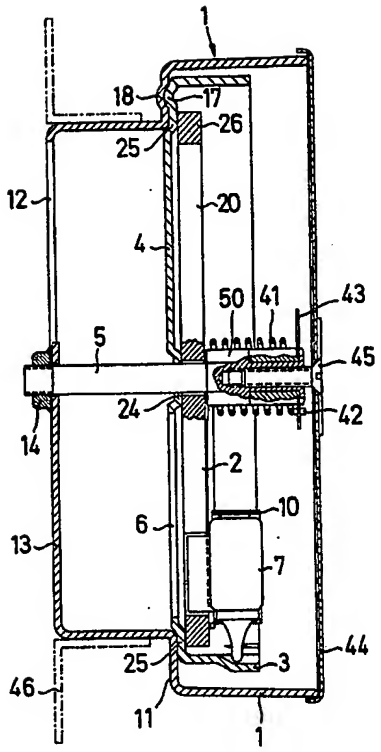

FIG. 4

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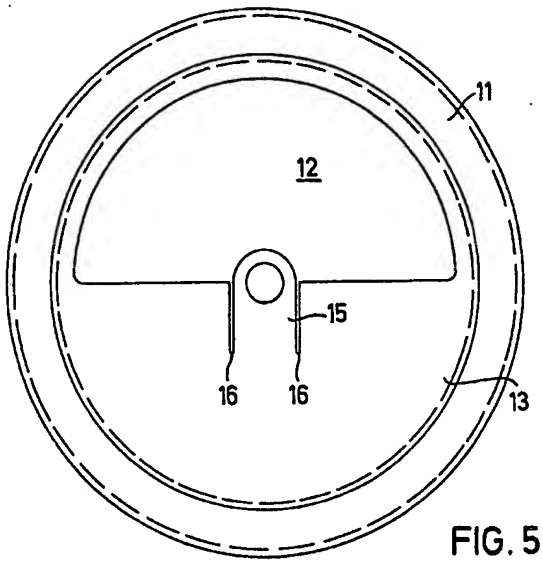

FIG. 5

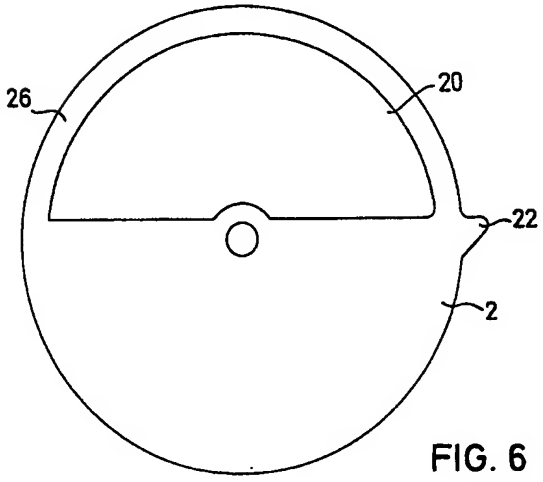

FIG. 6

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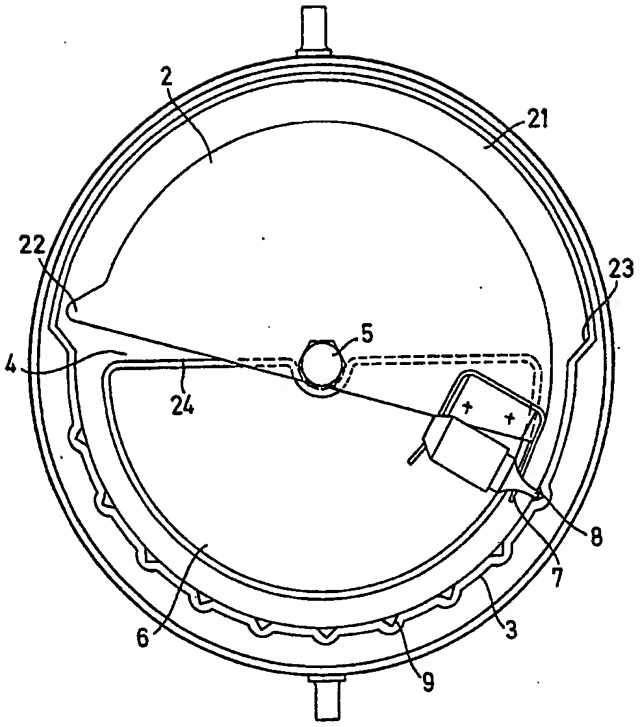

FIG. 7

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